

Novel Reduced Order in Time Models for Problems in Nonlinear Aeroelasticity, Phase I

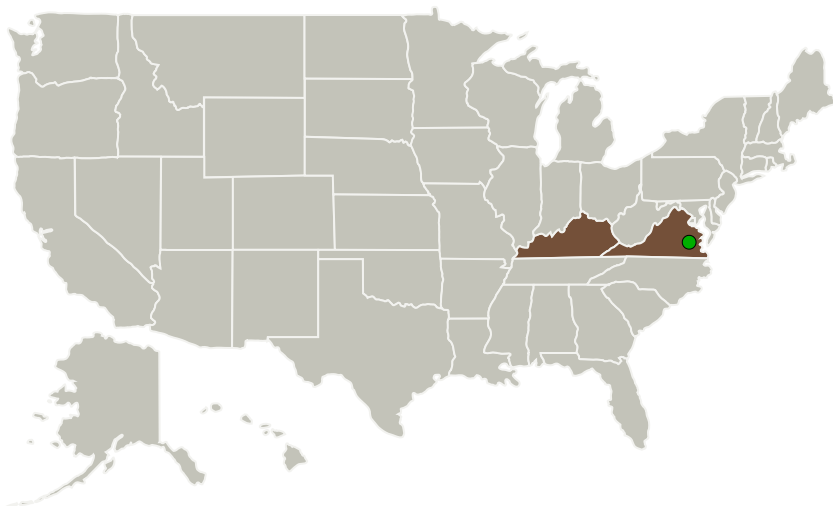
Completed Technology Project (2010 - 2010)



Project Introduction

Research is proposed for the development and implementation of state of the art, reduced order models for problems in nonlinear aeroelasticity. Highly efficient and accurate aeroelastic simulation tools will be constructed based upon the mathematical formalism of optimal prediction theory and a novel implementation of a filtered harmonic balance solution methodology. The implications of the proposed work include orders of magnitude reduction in computational time, with minimal loss of accuracy, for time periodic problems in nonlinear aeroelasticity. The application of the proposed innovations spans the range of flight, from high-speed transport vehicles, to small-scale, flapping Micro-Air vehicles. Anticipated results include 1) the implementation of the proposed reduced order methodology into both a standard grid-based aeroelastic tool and a material point method monolithic aeroelastic solver for the production of technology ready, multi-flow regime aeroelastic simulation tools 2) application of the proposed work to large-scale simulation and comparison with experiment and "full-order" aeroelastic simulations and 3) advancement of the state of knowledge for nonlinear problems in aeroelasticity in both the subsonic, low Reynolds number regime and transonic high Reynolds number regime.

Primary U.S. Work Locations and Key Partners



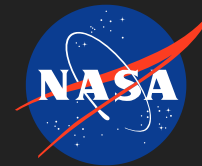
Novel Reduced Order in Time Models for Problems in Nonlinear Aeroelasticity, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Novel Reduced Order in Time Models for Problems in Nonlinear Aeroelasticity, Phase I

Completed Technology Project (2010 - 2010)



Organizations Performing Work	Role	Type	Location
Advanced Dynamics, Inc.	Lead Organization	Industry Minority-Owned Business	Lexington, Kentucky
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Kentucky	Virginia
----------	----------

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140534>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Dynamics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

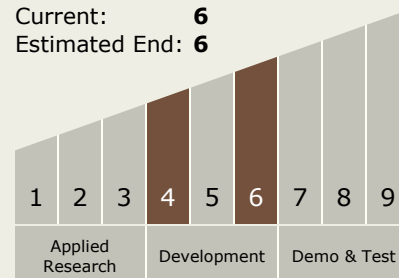
Carlos Torrez

Principal Investigator:

Patrick Hu

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



Novel Reduced Order in Time Models for Problems in Nonlinear Aeroelasticity, Phase I

Completed Technology Project (2010 - 2010)



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.3 Aeroelasticity

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System